WHAT IS CLAIMED IS:

1. A process for synthesizing photocurable poly(ethynyl)carbosilane comprising the steps of:

a. mixing dichlorosilane and trichlorosilane reagents;

b. adding sub-stoichiometric amounts of alkali metal; and

c. adding excess sodium acetylide.

2. A process for synthesizing photocurable poly(ethynyl)carbosilane comprising the steps of:

a. mixing dichlorosilane and trichlorosilane reagents in the presence of methylene bromide;

b. adding sub-stoichiometric amounts of alkali metal; and

c. adding excess sodium acetylide.

3. A process for synthesizing photocurable poly(ethynyl) carbosilane comprising the steps of:

a. mixing dichlorosilane and trichlorosilane reagents in the presence of methylene bromide;

b. adding sub-stoichiometric amounts of sodium metal; and

c. adding excess sodium acetylide.

4. A process for synthesizing photocurable poly(ethynyl) carbosilane comprising the steps of:

a. mixing dichloromethylsilane and trichlorophenylsilane reagents in the presence of methylene bromide;

b. adding sub-stoichiometric amounts of sodium metal; and

c. adding excess sodium acetylide.

5. A process for synthesizing photocurable poly(ethynyl) carbosilane comprising the steps of:

a. mixing dichloromethylsilane and trichlorophenylsilane reagents in the presence of methylene bromide;

b. adding sub-stoichiometric amounts of molten sodium metal under flowing argon gas; and

c. adding excess sodium acetylide dissolved in dimethyl formamide.

6. A process for synthesizing photocurable poly(ethynyl) carbosilane comprising the steps of:

a. forming a dispersion of sub-stoichiometric amounts of alkali metal;

b. adding dichlorosilane and trichlorosilane reagents; and

c. adding excess sodium acetylide.

7. A process for synthesizing photocurable poly(ethynyl) carbosilane comprising the steps of:

a. forming a dispersion of sub-stoichiometric amounts of molten sodium metal in a solvent;

b. adding dichlorosilane and trichlorosilane reagents; and

c. adding excess sodium acetylide.

8. A process for synthesizing photocurable poly(ethynyl) carbosilane comprising the steps of:

a. forming a dispersion of sub-stoichiometric amounts of molten sodium metal in a solvent;

b. adding dichloromethylsilane and trichlorophenylsilane reagents; and

c. adding excess sodium acetylide in dimethylbromide.

9. A process for synthesizing photocurable poly(ethynyl) carbosilane comprising the steps of:

a. forming a dispersion of sub-stoichiometric amounts of molten sodium metal in xylene;

b. adding dichloromethylsilane and trichlorophenylsilane reagents; and

c. adding excess sodium acetylide in dimethylbromide.

10. A process for synthesizing photocurable poly(ethynyl) carbosilane comprising the steps of:

a. forming a dispersion of sub-stoichiometric amounts of molten sodium metal in xylene;

b. adding dichloromethylsilane and trichlorophenylsilane reagents;

c. filtrating insoluble by-products;

d. evaporating xylene solvent from poly(chloro)carbosilane polymer;

e. dissolving said aforementioned polymer in tetrahydro furan; and

f. adding excess sodium acetylide dissolved in dimethyl bromide.

11. A process of forming a photo-curable pre-ceramic polymer, poly(ethynyl)-carbosilane to silicon carbide ceramic comprising the steps of:

a. reacting sodium acetylide with organo-chlorosilanes; and

b. condensing (polymerizing) the resultant organo-(ethynyl)chlorosilane product of step a with an excess of an alkali metal.

12. A process of forming a photo-curable pre-ceramic

polymer, poly(ethynyl)-carbosilane to silicon carbide ceramic comprising the steps of:

a. reacting sodium acetylide with organochloro-silanes; and

b. condensing (polymerizing) the resultant organo-ethynyl)chlorosilane product of step a with an excess of an alkali metal sodium.

13. A process of forming a photo-curable pre-ceramic polymer, poly(ethynyl)-carbosilane, to silicon carbide ceramic comprising the steps of:

a. reacting sodium acetylide with a mixture of organodichlorosilanes and organotrichlorosilanes; and

b. condensing (polymerizing) the resultant organo (ethynyl)-chlorosilane product of step a with an excess of an alkali metal.

14. A process according to claim 1 in which the organo chlorosilane is selected from a group of one or more of the following: dichlorodimethylsilane, trichloro-phenylsilane (tri-functional), and methyltrichlorosilane.

15. A process of forming a photo-curable pre-ceramic polymer, poly(ethynyl)-carbosilane to silicon carbide ceramic comprising the steps of:

a. reacting a sub-stoichiometric amount of an alkali metal with organochloro-silanes; and

b. reacting the partially polymerized polyorganochloro-silane with sodium acetylide.

16. A process of forming a photo-curable pre-ceramic polymer, poly(ethynyl)- carbosilane to silicon carbide ceramic comprising the steps of:

a. reacting a sub-stoichiometric amount of sodium metal with organochlorosilanes; and

b. reacting the partially polymerized polyorganochlorosilane with sodium acetylide.

17. A process of forming a photo-curable pre-ceramic polymer, poly(ethynyl)carbosilane to silicon carbide ceramic comprising the steps of:

a. reacting a sub-stoichiometric amount of an alkali metal with a mixture of organodichlorosilanes and organotrichlorosilanes; and

b. reacting the partially polymerized polyorganochlorosilane with sodium acetylide.

18.A process according to claim 5 in which the organochlorosilane is selected from a group consisiting of one or more of the following: dichlorodimethylsilane, trichlorophenylsilane (tri-functional), and methyltrichlorosilane.

19. A process of forming a photo-curable pre-ceramic polymer, poly(ethynyl)silazane, to silicon nitride ceramic comprising the steps of:

a. reacting sodium acetylide with organochlorosilanes; and

b. condensing (polymerizing) the resultant organo-(ethynyl)chlorosilane product of step a with ammonia.

20. A process of forming a photo-curable pre-ceramic polymer, poly(ethynyl)-silazane to silicon nitride ceramic comprising the steps of:

a. reacting sodium acetylide with organochloro-silanes; and

b. condensing (polymerizing) the resultant organo-(ethynyl) chlorosilane product of step a with ammonia.

21. The process of preparing photocurable CERASETTM SZ inorganic polymer comprising the step adding a photo-

initiator to CERASETTM SZ inorganic polymer.

22. The process of claim 21, in which said photo-initiator is Camphorquinone.

23. The process of claim 21 in which said photo-initiator is IRGACURE® 1800.

24. The process of preparing photocurable allylhydridopolycarbosilane polymer comprising the step of adding a photo-initiator to allylhydridopolycarbosilane polymer.

25. The process of claim 24, in which said photo-initiator is Camphorquinone.

26. The process of claim 24, in which said photo-initiator is IRGACURE® 1800.

27. A process of forming a photo-curable pre-ceramic polymer, poly(ethynyl)silazane, to silicon nitride ceramic comprising the steps of:

a. reacting sodium acetylide with a mixture of organo-dichlorosilanes and organotrichlorosilanes; and

b. condensing (polymerizing) the resultant organo-(ethynyl)chloro-silane product of step a with ammonia.

28. A process according to claim 27 in which the organochlorosilane is selected from a group consisting of one or more of the following: dichlorodimethylsilane, trichlorophenylsilane (tri-functional) and methyltri chlorosilane.

29. A process of forming a photo-curable pre-ceramic polymer, poly(ethynyl)-silazane to silicon nitride ceramic comprising the steps of:

a. reacting a sub-stoichiometric amount of ammonia

with organo-chlorosilanes; and

b. reacting the partially polymerized polyorgano chlorosilazane with sodium acetylide.

30. A process of forming a photo-curable pre-ceramic polymer, poly(ethynyl)-silazane to silicon nitride ceramic comprising the steps of;

a. reacting a sub-stoichiometric amount of ammonia with organo-chlorosilanes; and

b. reacting the partially polymerized polyorgano chlorosilazane with sodium acetylide.

31. A process of forming a photo- curable pre-ceramic polymer, poly(ethynyl)-silazane to silicon nitride ceramic comprising the steps of:

a. reacting a sub-stoichiometric amount of ammonia with with a mixture of organodichlorosilanes and

organotrichlorosilanes; and

b. reacting the partially polymerized polyorganoc hlorosilazane with sodium acetylide.

32. A process for fabricating a ceramic matrix composites comprising the steps of:

a. preparing a solution of thermoplastic photo-curable pre-ceramic polymer;

b. passing a pre-preg through said solution of thermoplastic photo-curable pre-ceramic polymer;

c. applying said pre-preg to a shaped mandrel;

d. using light energy to induce cross-linking of said photo-curable pre-ceramic polymer after application to said mandrel whereby said thermoplastic pre-ceramic polymer is curved; and

e. pyrolyzing said cured thermoplastic pre-ceramic polymer matrix composite material.

33. A single-step fabrication of continuous ceramic fiber ceramic matrix composites employing a thermoplastic photo-curable pre-ceramic polymer in which the component is shape by a variety of standard composite fabrication techniques, such as filament winding, tape winding, and woven cloth winding comprising steps of:

a. passing ceramic fiber monofilament, tow, mat, or woven cloth through a solution of said thermoplastic photo-curable pre-ceramic polymer;

aa. applying ceramic fiber monofilament, tow, mat, or woven cloth to a shaped mandrel;

bb. using photo-energy of the ultraviolet, visible or infrared light spectrum to induce cross-linking (curing) of the photo-curable pre-ceramic polymer after application to said mandrel; and

cc. either partially or completely pyrolyzing the now cured pre-ceramic polymer matrix composite material.

35. A process for synthesizing ceramic matrix composites according to claim 34 in which the pre-ceramic polymer is poly(ethynyl)carbosilane.

36. A process for synthesizing ceramic matrix composites according to claim 34 in which the pre-ceramic polymer yields silicon carbide upon pyrolysis.

37. A process for synthesizing ceramic matrix composites according to claim 34 in which the pre-ceramic polymer yields an oxide ceramic upon pyrolysis.

38. A process for synthesizing ceramic matrix composites according to claim 34 in which the pre-ceramic polymer yields titanium carbide upon pyrolysis.

39. A process for synthesizing ceramic matrix composites according to claim 34 in which the pre-ceramic polymer

yields aluminum nitride upon pyrolysis.

[39] 40. A process for synthesizing ceramic matrix composites according to claim 34 in which the pre-ceramic polymer yields silicon nitride upon pyrolysis.

[40] 41. A process for synthesizing ceramic matrix composites according to claim 34 in which the pre-ceramic polymer yields aluminum oxide upon pyrolysis.

[41] 42. Single-step fabrication of continuous ceramic fiber ceramic matrix composites employing a thermoplastic photo-curable pre-ceramic polymer in which the component is shape by a variety of standard composite fabrication techniques, such as filament winding, tape winding, and woven cloth winding under inert atmosphere comprising steps of:

a. passing ceramic fiber monofilament, tow, mat, or

woven cloth through a solution of said thermoplastic photo-curable pre-ceramic polymer;

b. applying ceramic fiber monofilament, tow, mat, or woven cloth to a shaped rotating mandrel;

c. use of a heated or unheated compaction roller to press the thermoplastic pre-ceramic polymer onto the mandrel;

d. using ultraviolet, visible, or infrared light to induce cross-linking (curing) of the photo-curable pre-ceramic polymer thereby rendering a thermoset polymer;

e. either partially or completely pyrolyzing the now cured pre-ceramic polymer matrix material; and

f. followed by the final heat treatment of the shaped ceramic matrix composite "brown body".

43. A process for synthesizing ceramic matrix composites according to claim 42 in which the pre-ceramic polymer is poly(ethynyl)carbosilane.

4~~4~~3. A process for synthesizing ceramic matrix composites according to claim 42 in which the pre-ceramic polymer yields an oxide ceramic upon pyrolysis.

4~~5~~4. A process for synthesizing ceramic matrix composites according to claim 42 in which the pre-ceramic polymer yields silicon nitride upon pyrolysis.

4~~6~~5. A process for synthesizing ceramic matrix composites according to claim 42 in which the pre-ceramic polymer yields titanium carbide upon pyrolysis.

4~~7~~6. A process for synthesizing ceramic matrix composites according to claim 42 in which the pre-ceramic polymer yields aluminum nitride upon pyrolysis.

4~~8~~7. A process for synthesizing ceramic matrix composites according to claim 42 in which the pre-ceramic polymer

yields silicon carbide upon pyrolysis.

~~49~~ 48. A process for synthesizing ceramic matrix composites according to claim 42 in which the pre-ceramic polymer yields aluminum oxide upon pyrolysis.

~~50~~ 49. Single-step fabrication of continuous ceramic fiber ceramic matrix composites employing a thermoplastic photo-curable pre-ceramic polymer in which the component is shape by a variety of standard composite fabrication techniques, such as filament winding, tape winding, and woven cloth winding, comprising steps of:

a. passing ceramic fiber monofilament, tow, mat, or woven cloth through a solution of said thermoplastic photo-curable pre-ceramic polymer;

b. applying ceramic fiber monofilament, tow, mat, or woven cloth to a moving flat substrate;

c. using a compaction roller to press the thermo-

plastic pre-ceramic polymer coated ceramic fiber onto flat substrate;

d. using photo-light of the ultraviolet, visible, or infrared light spectrum to induce cross-linking curing) of the photo-curable pre-ceramic polymer thereby rendering a thermoset polymer; and

e. either partially or completely pyrolyzing the now cured pre-ceramic polymer matrix coated ceramic fiber material.

51. A process for synthesizing ceramic matrix composites according to claim 50 in which the pre-ceramic polymer is poly(ethynyl)carbosilane.

52. A process for synthesizing ceramic matrix composites according to claim 50 in which the pre-ceramic polymer yields an oxide ceramic upon pyrolysis.

2
53. A process for synthesizing ceramic matrix composites according to claim 50 in which the pre-ceramic polymer yields silicon nitride upon pyrolysis.

3
54. A process for synthesizing ceramic matrix composites according to claim 50 in which the pre-ceramic polymer yields titanium carbide upon pyrolysis.

4
55. A process for synthesizing ceramic matrix composites according to claim 50 in which the pre-ceramic polymer yields aluminum nitride upon pyrolysis.

5
56. A process for synthesizing ceramic matrix composites according to claim 50 in which the pre-ceramic polymer yields silicon carbide upon pyrolysis.

6
57. A process for synthesizing ceramic matrix composites according to claim 50 in which the pre-ceramic polymer yields aluminum oxide upon pyrolysis.